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FLAX-MANAGEMENT PRACTICES IN IMPERIAL VALLEY, WITH WORLD STATISTICS

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FLAX-MANAGEMENT PRACTICES IN IMPERIAL VALLEY, WITH WORLD STATISTICS[1]

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INTRODUCTION

THIS BULLETIN has been prepared for the purpose of presenting to flax growers a summary and an analysis of flax-production costs and management practices in Imperial Valley. In addition, some important facts are presented concerning the products of flax and market facilities. Tables 18 to 29 in the Appendix contain data on production, supplies, imports, exports, and prices for the United States and the world.

In 1935, in coöperation with flax growers in the Imperial Valley, the Agricultural Extension Service of the University of California began a study of costs, yields, income, and other factors that determine efficiency in the production of flax. This enterprise-efficiency study covers a period of five years, 1935 to 1939, inclusive. The number of records each year varied from 15 to 20 covering an acreage of 1,882 to 3,620. A total of 85 records covering 13,784 acres is included in the five-year period. The data in tables 3 to 14, inclusive, are compiled from records kept by the growers coöperating on a voluntary basis and turned in to the local farm advisor's office. These records are not presented as an average for the industry and hence may not be a true cross section, and the profits and incomes are probably considerably higher than those of the average producer. This is indicated by the greater average yield per acre for those records in the study than the average yield of the state (see table 2). The yearly average yield for the records in the study ranged from 5.0 to 13.9 bushels per acre higher than the state average for the corresponding years.

BRIEF HISTORY OF FLAX IN CALIFORNIA

In 1915 the California Agricultural Experiment Station in coöperation with the United States Department of Agriculture began experimenting with flax at several stations in the state. These experiments indicated that flax could be grown with a fair degree of success, but primarily because of better prices for other crops, no commercial plantings of importance were made as a result of these experiments. The recent commercial production of flax in the state is the outgrowth of experiments begun in 1927 at the Imperial Valley Field Station at Meloland. Many varieties of flax were tested, and the Punjab variety stood out as superior to all others.

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In 1930 a plot of this variety at the Imperial Valley Field Station yielded 28.5 bushels per acre. In 1931 the seed from 2 acres was distributed to a few farmers in the Valley who harvested 110 acres in 1932 and 350 acres in 1933.

Several factors have contributed to the recent rapid expansion of commercial flax production in California: (1) The Punjab variety has been developed and has demonstrated its adaptability to Imperial Valley conditions and to other parts of the state. (2) The relatively low price of other grains has encouraged flax production. (3) Cottonseed-oil mills, which are located in the cotton-growing areas throughout the state, are readily available for use in crushing the oil from flaxseed. Inasmuch as flaxseed is harvested during May, June, and July, these mills may be employed during a period when there is little demand for crushing cottonseed. (4) The tillage and harvesting equipment[5] needed for growing flax is practically the same as that needed for producing small grains; consequently, very little additional equipment or change in old equipment is required.

Acreage and Yields.—In 1934, 11,000 acres of flax were planted in the Imperial Valley yielding 242,000 bushels, with an average yield of 22 bushels per acre. In 1935 Imperial Valley increased its acreage to 23,500; the south San Joaquin Valley counties of Fresno, Kings, Kern, Tulare, and Madera planted approximately 9,600 acres; and all other counties, 4,900 acres. Acreage steadily increased throughout these areas to reach an estimated total for the 1939 crop of 108,000 acres with a production of 1,728,000 bushels (table 1). For the crop harvested in 1939, Fresno County led with an acreage estimated at 46,000; Imperial was second with 42,000 acres; and San Joaquin, third with 4,500 acres. In 1939 California ranked third (see table 23) among the states in the production of flaxseed, being exceeded only by Minnesota and North Dakota.

Average Yield per Acre.—The average yield per acre of flaxseed in California is considerably higher than in the United States as a whole (see table 22). For the six-year period 1934–1939, the average yield per acre in bushels ranged from 14.0 in 1936 to 22.0 in 1934. The average for the United States during the same period ranged from 5.0 bushels in 1936 to 8.6 in 1938 (table 2).

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[5] Division of Agricultural Engineering, Division of Agronomy, and Agricultural Extension Service. Flax harvesting investigations, 1939. Univ. California Col. Agr., Agr. Engin. Inform. Ser. No. 17:1–9, A–L. 1940. (Mimeo.)

TABLE 1

HARVESTED ACREAGE AND PRODUCTION ESTIMATES OF FLAX IN CALIFORNIA, 1934–1939

County or area	1934		1935		1936		1937		1938		1939*	
	1,000 acres	1,000 bushels	1,000 acres	1,000 bushels	1,000 acres	1,000 bushels	1,000 acres	1,000 bushels	1,000 acres	1,000 bushels	1,000 acres	1,000 bushels
Imperial	11	242	23.5	399.5	19.0	304.0	21.4	374.5	12.0	264.0	42.0	820.0
South San Joaquin†	—‡	—	9.6	120.8	14.4	195.9	8.0	137.4	16.9	315.9	51.7	748.5
All other counties	—	—	4.9	49.7	8.6	88.1	10.6	148.1	7.1	104.1	14.3	159.5
Total state	11	242	38.0	570.0	42.0	588.0	40.0	660.0	36.0	684.0	108.0	1,728.0

* Preliminary estimate.

† Fresno, Kings, Kern, Tulare, and Madera.

‡ Dashes indicate data not available.

Source of data:
California Coöperative Crop Reporting Service, Sacramento.

METHOD OF CONDUCTING ENTERPRISE-EFFICIENCY STUDIES

The flax enterprise-efficiency study in Imperial County, begun in 1935, was conducted by the county farm advisor in coöperation with flax growers who volunteered to provide accurate and detailed records of costs, yields, income, hours of man labor and tractor work required for each operation, kinds and quantities of materials used, and dates of performance of the operations. Such records were reported on blank forms furnished by the farm advisor. Such an individual record may comprise the operator's entire farm business or be only a part of it. Generally these records were only a part of the farm business. A few of the coöperators, however, provided more than one record, the records being on land farmed under different conditions. Since participation was on a voluntary basis, the records obtained may not be a true cross section of the flax industry in the Imperial Valley. Probably the records in this study are better than the average, since participation would be more readily expected of growers with above-average managerial ability. In fact, records in this study show an average yield per acre higher than the county average.

TABLE 2

AVERAGE YIELD OF FLAXSEED PER ACRE IN CALIFORNIA AND THE UNITED STATES, 1934–1939

Year	Imperial Valley records in study	California	United States
	bushels	*bushels*	*bushels*
1934	——*	22.0	5.7
1935	21.2	15.0	6.9
1936	19.0	14.0	5.0
1937	22.4	16.5	7.6
1938	26.6	19.0	8.6
1939†	29.9	16.0	7.6

* Dashes indicate data not available.

† Preliminary estimate.

Source of data:

United States Department of Agriculture Bureau of Agricultural Economics. General crop report. December issues. (Mimeo.)

As each year of an enterprise-efficiency study was completed, each coöperator received a detailed analysis of his costs, yield, income, and management practices together with a mimeographed summary of all records. Strong and weak spots in management practices of the coöperators were shown by comparison with other records and with the average of all records.

EXPLANATION OF TERMS USED IN FLAX ENTERPRISE-EFFICIENCY STUDY

Total income is the result of the yield times the price at the place where the ownership of the commodity is transferred to the buyer.

Total costs include all costs incurred by the operator up to the time and place of sale of the product. In a few cases the sale was made at the farm. In such instances no charge was made for hauling or recleaning, although a deduction was made for dockage. Out of the total of 85 records 34 were on rented land, either on a share or cash basis. In these cases the landowner paid a portion or all of the irrigation-water costs and occasionally furnished or paid for other items. Such items furnished by the landowners were not included as a part of the operator's cost. The rental basis varied in proportion to the amount of the items furnished by the landowner. These items of cost are finally charged against the enterprise in the item of rent.

Labor costs include all hired and contract labor and the labor performed by the operator. No charge was made for management. Field power was charged at an hourly rate which included interest on investment, depreciation, repairs, insurance, taxes, storage, and servicing as well as operating costs. *Cultural labor costs* include all labor costs and field power incurred by the operator up to the time of harvesting. *Harvesting labor* includes all costs from the beginning of harvest until the product is sold.

Material costs are the costs to the operator of irrigation water, seed, sacks, twine, fertilizer, and miscellaneous items. *Cash-overhead costs* consist in taxes, interest on operating capital, insurance, and other minor cash costs. *Depreciation costs* represent the charges made against the equipment and improvements which are owned by the operator and not charged in other costs at an hourly rate. They do not include depreciation costs on equipment hired or used in contracted work. Interest at 5 per cent is charged on the capital investment. *Rent* is the amount in cash or the value of the share of the crop paid by the operator.

Management income is the difference between all costs and total income. *Capital and management income* is management income plus the charge made for interest on capital investment and rent.

YIELD, INCOME, AND COSTS

Table 3 presents a general summary of yield, income, and costs per acre and per bushel, with averages of the records for each year, and a general average for the five years. The 85 records included in this study averaged 162 acres each with an average yield of 23.0 bushels of recleaned seed per acre. Dockage averaged 2.0 bushels per acre, which makes a total average of 25 bushels per acre of field-run flax. The average price received by the grower per bushel of recleaned seed ranged from $1.67 to $2.17, with an average of $1.91. If the income from the sale of dockage and straw is added, the total average income per bushel of recleaned flaxseed for all records is $2.02. The total of all costs is $1.43 per bushel, which leaves a management income of $0.59 per bushel. The average total income per acre for all records is $46.48, the costs are $32.91, which leaves a management income of $13.57. Capital and management income per acre, that is, without considering interest on capital investment or rent on land as a cost, averaged $22.64.

TABLE 3

GENERAL SUMMARY OF FLAX ENTERPRISE-EFFICIENCY-STUDY RECORDS, IMPERIAL VALLEY, 1935–1939

	1935	1936	1937	1938	1939	5-year average
Number of records	16	20	17	17	15	85*
Total acres	2,743	3,620	3,197	2,340	1,882	13,784*
Average number acres per record	171	181	188	138	125	162
Average yield per acre:						
Flaxseed, recleaned, bushels	21.2	19.0	22.4	26.6	29.9	23.0
Dockage and other seeds, bushels	3.5	2.8	2.1	0.9	0.8	2.0
Total field run, bushels	24.7	21.8	24.5	27.5	30.7	25.0
Straw harvested for fiber, tons	0.0	0.0	0.46	0.84	0.70	0.06
Income and costs in dollars per acre						
Income:						
Flaxseed, recleaned	35.52	38.38	48.46	48.50	53.16	43.89
Dockage and other seeds	1.52	0.94	1.22	0.41	0.27	0.94
Straw	0.00	0.00	0.84	4.48	5.09	1.65
Total income	37.04	39.32	50.52	53.39	58.52	46.48
Costs:						
Cultural labor and field power	7.79	5.91	7.48	8.23	8.15	7.35
Harvest labor and field power	7.74	6.54	8.51	9.08	11.64	8.56
Materials, water, seed, etc.	4.94	4.48	6.17	6.37	7.47	5.69
Cash overhead, taxes, etc.	2.31	2.03	2.18	2.02	2.66	2.21
Total cash costs	22.78	18.96	24.34	25.70	29.92	23.61
Depreciation on improvements and equipment	0.14	0.16	0.34	0.22	0.30	0.23
Total cash and depreciation	22.92	19.12	24.68	25.92	30.22	23.84
Interest on investment and rent	6.25	7.26	10.69	12.60	9.52	9.07
Total all costs	29.17	26.38	35.37	38.52	39.74	32.91
Management income	7.87	12.94	15.15	14.87	18.78	13.57
Capital and management income	14.12	20.20	26.11	27.47	28.30	22.64

* Five-year total, not five-year average.

(Concluded on next page.)

TABLE 3—(*Concluded*)

GENERAL SUMMARY OF FLAX ENTERPRISE-EFFICIENCY-STUDY RECORDS, IMPERIAL VALLEY, 1935–1939

	1935	1936	1937	1938	1939	5-year average
Income and costs in dollars per bushel† (except income for straw)						
Income:						
Flaxseed, recleaned	1.67	2.02	2.17	1.81	1.77	1.91
Dockage and other seeds	0.43	0.34	0.58	0.48	0.34	0.47
Straw, per ton	0.00	0.00	5.54	7.20	7.20	6.15
Total income‡	1.74	2.07	2.26	1.99	1.95	2.02
Costs:						
Cultural labor and field power	0.37	0.31	0.33	0.31	0.37	0.32
Harvest labor and field power	0.38	0.35	0.38	0.34	0.39	0.36
Materials, water, seed, etc.	0.23	0.23	0.28	0.24	0.25	0.25
Cash overhead, taxes, etc.	0.11	0.11	0.10	0.07	0.09	0.10
Total cash costs	1.09	1.00	1.09	0.96	1.00	1.03
Depreciation on improvements and equipment	0.01	0.01	0.02	0.01	0.01	0.01
Total cash and depreciation	1.10	1.01	1.11	0.97	1.01	1.04
Interest on investment and rent	0.27	0.38	0.47	0.47	0.32	0.39
Total all costs	1.37	1.39	1.58	1.44	1.33	1.43
Management income	0.37	0.68	0.68	0.55	0.62	0.59
Capital and management income	0.64	1.06	1.15	1.02	0.94	0.98

† Bushel of flax is 56 pounds.

‡ Income from straw and dockage and other seeds converted to equivalent per bushel of recleaned flaxseed in calculating total income.

Table 3 emphasizes the importance of high yield per acre in relation to costs per bushel. Certain costs per acre are relatively fixed regardless of yield. Interest on investment, taxes, certain tillage operations, and seed are examples of costs which would be approximately the same on land yielding 10 bushels as on land yielding 20 bushels. These fixed costs would be twice as great per bushel on the land yielding 10 bushels as on that yielding 20 bushels. Hence, the cost per bushel is usually lower where yields are better than average. The costs in this table are grouped into major items of cultural and harvest labor, material, cash overhead, depreciation on improvements and equipment, and interest and rent. These major items are analyzed in detail in subsequent tables.

PERCENTAGE DISTRIBUTION OF COSTS

The relative importance of cost factors and sources of income on a percentage basis is shown in table 4.

All man labor and field power represent 47.8 per cent of all costs, which are divided almost equally between cultural and harvest labor.

The average cost of land, improvements, and equipment, calculated at 5 per cent of its value or charged as rent actually paid, represents 27.6 per cent of all costs. All materials used represent 17.3 per cent, cash overhead 6.7 per cent, and depreciation, 0.6 per cent.

The income from recleaned flaxseed represents 94.4 per cent of all income, and dockage and straw, 5.6 per cent.

DETAILED COSTS AND INPUTS OF PRODUCTION FACTORS

Seedbed Preparation.—The methods of preparing the land for seeding will depend on the previous crop, the kind and abundance of weeds, and the texture of the soil. Plowing may not be necessary if the land was previously in a clean-cultivated annual crop, such as sugar beets, beans, lettuce, or cantaloupes. Land in alfalfa or other perennial crops or covered with weeds or considerable crop refuse is usually plowed.

TABLE 4

PERCENTAGE DISTRIBUTION OF COSTS AND INCOME FOR FLAX

	Percentage of total
Costs:	
All cultural labor and field power	22.4
All harvest labor and field power	25.4
Total labor costs	47.8
Interest on investment and rent (combined average)	27.6
All materials used	17.3
Cash overhead	6.7
Depreciation charges on improvement and equipment	0.6
Total	100.0
Income:	
Flaxseed recleaned	94.4
Dockage and straw	5.6
Total	100.0

The enterprise-efficiency studies indicate that 85 per cent of the cooperators plowed the land before seeding. Generally the plowing was performed with tractor and disk plows. These studies indicate that approximately 1.2 hours of man labor were required to plow 1 acre at an average cost for all records of $2.33 per acre (table 5).

After plowing is completed, borders are made and the land is irrigated. This irrigation settles the soil, germinates weed seed, and supplies moisture to maintain the flax for several weeks. When the soil is dry enough after the preplanting irrigation, the land is mulched to a depth of about 2 inches. Operations necessary to do this may consist in light disking, shallow knifing or harrowing, and light floating or dragging, and sometimes rolling or cultipacking.

Frequently, growers accomplish both mulching and seeding operations by combining all necessary implements into one tandem outfit—for example, a tractor pulling a light disk or spring-tooth harrow equipped with sweep knives, followed by a seed drill to which is attached a light drag or cultipacker. This serves to decrease cost of operations, saves time, and conserves vital soil moisture, since no time elapses between operations for drying out.

The number of times necessary to go over the land in preparing the seedbed varied greatly (table 6), according to the condition of the soil and kind of field power and tillage tools used. The records show a range of from one to six times. The cost per acre varied accordingly. The average of all records for the five-year period was $2.01 per acre (table 5) and required an average of about 1 hour of labor per acre.

TABLE 5

AVERAGE COSTS OF SEEDBED PREPARATION PER ACRE OF MAN LABOR AND FIELD POWER,* 1935–1939

Operations†	1935	1936	1937	1938	1939	5-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Plowing	3.05	1.73	2.44	2.36	2.30	2.33
All other preparation	1.88	1.62	2.20	2.75	2.14	2.01
Total average costs per acre†	4.93	3.35	4.32	4.54	4.94	4.31

* The cost of field power includes contract work, and in case the operator owned his own field power, a charge was made sufficient to cover interest on investment and depreciation as well as operating costs.

† The costs per acre for each operation is the average cost for the acres on which that operation was performed; hence, the total average cost per acre is not the sum of the individual items.

TABLE 6

OPERATIONS IN SEEDBED PREPARATION OF FLAX, 1935–1939

	1935	1936	1937	1938	1939
Number of records in study	16	20	17	17	15
Number of records reporting plowing	14	19	14	13	11
Number of records reporting no plowing	2	1	3	4	4
Range in number of diskings, harrowing, etc.	—*	1–5	1–4	3–6	4–9
Number reporting flax as preceding crop	3	7	8	4	7
Number reporting irrigating before planting	10	16	16	16	15
Number reporting no irrigating before planting	6	4	1	1	0

* Dashes indicate data not available.

The average cost of all seedbed preparation, not including the man labor of irrigation, for all records was $4.31 per acre (table 5). The input of man labor and tractor averaged about 2.2 hours per acre.

Seeding.—Seeding with a grain drill is the preferred method. Broadcasting is not recommended because the seed can neither be evenly distributed nor covered at a uniform depth, and also because more seed is required per acre than by drilling to obtain an equal stand. Usually no tillage operations are performed after seeding because of the danger of covering the seed too deep or disturbing the young plants. The average cost of seeding per acre for the five-year period, as shown in table 7, is $0.83 per acre. Other miscellaneous costs, such as hauling seed, etc., average $0.21 per acre, which makes a total of $1.04 per acre.

TABLE 7

AVERAGE COSTS OF SEEDING PER ACRE OF MAN LABOR AND FIELD POWER, 1935–1939

Operations	1935	1936	1937	1938	1939	5-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Drilling in seed	0.75	0.72	0.77	1.09	0.95	0.83
Miscellaneous	0.25	0.22	0.17			0.21
Total average costs per acre	1.00	0.94	0.94	1.09	0.95	1.04

TABLE 8

AMOUNTS OF SEED USED AND DATES OF PLANTING, 1935–1939

	1935	1936	1937	1938	1939	5-year average
Number of records in study	16	20	17	17	15	85*
Range in number of pounds of seed planted per acre	35–60	35–50	22–50	33–52	30–50	22–60
Average number of pounds of seed planted	42	43	43	43	40	43
Number of records in study planting†:						
Before October 15	0	0	0	1	0	1*
October 15–November 1	1	4	4	7	4	20*
November 1–November 15	7	5	2	7	9	41*
November 15–December 1		8	0	1	2	
After December 1	5	1	0	0	0	6*

* Five-year total, not five-year average.

† Planting data not reported on all records.

The average amount of seed used per acre in all records was 43 pounds, ranging from 22 to 60 pounds. Table 8 indicates growers prefer the period October 15 to November 15 as the most satisfactory time for planting.

Irrigation.—Irrigation labor consists of ditch work, preparation of borders, and the application of irrigation water. Ditch work usually consists in cleaning debris from ditches and making minor repairs. The average cost for this work for the five-year period was $0.25 per acre. Borders for irrigation checks are made before planting and are used without further attention throughout the growing season. The average cost for this operation was $0.40 per acre for the records in the study (table 9). The usual contract price was $0.50 per acre.

TABLE 9
AVERAGE IRRIGATION COSTS PER ACRE OF MAN LABOR AND FIELD POWER, 1935–1939

Operations	1935	1936	1937	1938	1939	5-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Irrigation ditch and miscellaneous	0.45	0.38	0.17	0.67	0.55	0.25
Borders	0.47	0.35	0.46		0.40	0.40
Applying water	1.22	1.18	1.77	1.38	1.27	1.38
Total average irrigation labor	2.14	1.91	2.40	2.05	2.22	2.03

The labor of applying irrigation water shows an average cost of $1.38 per acre (table 9). This, of course, varied from ranch to ranch and from year to year according to the amount of water applied, the number of applications, and the amount of rainfall during the growing season. Table 10 shows quantities used and number of applications during this period and indicates to some degree the changes that took place.

TABLE 10
IRRIGATION INPUTS OF LABOR AND MATERIALS, 1935–1939

	1935	1936	1937	1938	1939	5-year average
Number of records in study	16	20	17	17	15	85*
Number of coöperators in the study who irrigated land before planting	10	16	16	16	15	73*
Number who did not irrigate before planting	6	4	1	1	0	12*
Average number of irrigations after planting	4	5	5	5	5	5
Range in number of irrigations	3–6	3–6	3–7	3–8	5–8	3–8
Range in acre-inches per acre applied	12–40	14–49	20–41	17–47	18–37	12–47
Average acre-inches applied	22.0	25.0	27.0	27.0	24.5	25.2
Average acre-inches per application	4.4	4.2	4.5	4.5	4.0	4.3
Average rainfall (Brawley)†	3.4	1.1	0.8	1.4	—‡	2.7§

* Five-year total, not five-year average.

† Annual summaries of climatological data for California, United States Weather Bureau.

‡ Dash indicates data not available. § Thirty-year average.

In the 1935 study 6 out of 16 growers did not irrigate before seeding, while in 1939 all records show preplanting irrigation. The average number of irrigations after planting for all records for the five-year period was 5. The variations in number of all irrigations ranged from 3 to 8 (table 10).

The average amount of water applied for all records was 25.2 acre-inches per acre. The amount varied from 12 to 47 acre-inches. The amount applied per irrigation averaged 4.3 acre-inches per acre. The average annual rainfall over a thirty-year period for the United States Weather Bureau Station at Brawley, was 2.7 inches.

Harvesting Flaxseed.—The most common practice in the harvesting of flaxseed is the direct-combine method, provided the flax is thoroughly ripe, dry, and free from green weeds. If the field contains weeds that remain green after the flax is ripe, the windrower is used. A pickup attachment is then used on the combine.

Table 11 presents the average cost per acre by years, as reported by the coöperators in the study, for the harvesting operations.

TABLE 11

AVERAGE COSTS OF HARVESTING FLAXSEED PER ACRE OF MAN LABOR AND FIELD POWER, 1935–1939

Operations*	1935	1936	1937	1938	1939	5-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Windrowing	1.05	0.59	0.80	0.84	0.90	0.82
Combining	5.30	4.78	4.54	5.16	4.52	4.86
Hauling	0.76	1.03	2.00	1.54	2.87	1.62
Recleaning	1.36	0.71	1.01	1.14	1.40	1.17
Total average harvesting labor, all records	7.74	6.54	7.81	6.65	7.81	7.32

* Costs per acre only on acres involved; hence, the total average cost is not the sum of the original items.

The average cost of windrowing varied from $0.59 to $1.05 per acre, with an average of $0.82. The usual contract price per acre varied from $1.25 to $1.50. The average cost of combining varied from $4.50 to $5.30, with an average of $4.86. The usual contract price is $5.00 per acre. If yields are considerably above the average or the fields are unusually difficult to harvest, higher rates are charged. The cost of hauling depends upon the distance from field to selling point. The contract price varies from $1.00 to $3.75 per ton. The usual charge for recleaning was $0.10 per hundredweight.

Materials.—The average cost per acre of materials used in the production of flax by the coöperators in the enterprise-efficiency study is shown in table 12. Irrigation water is the largest single item. The amount used averaged a little over 2 acre-feet per acre. The costs are made up of the irrigation-district tax (varied from $2.40 to $4.65 per $100.00 assessed valuation), $0.50 per acre-foot of water used, and $0.25 per day for gate charge. The average amount of seed used for all records was 43 pounds per acre (table 8), and the usual price for good, selected seed was $0.05 per pound. The actual cash costs of sacks and twine to the coöperator varied considerably, the cost depending upon who furnished them. The costs of new sacks ranged from $0.075 to $0.09 each, and twine, $0.75 to $0.90 per pound.

TABLE 12

Average Cost Per Acre* of Materials and Supplies, 1935–1939

	1935	1936	1937	1938	1939	5-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Irrigation water	2.61	2.52	3.96	2.87	3.08	3.01
Seed	1.80	1.69	2.06	2.08	1.95	1.92
Sacks and twine	0.55	0.27	0.24	1.03	1.40	0.70
Miscellaneous, fertilizer, etc.	—†	2.25	0.39	0.37	3.24	—
Total average all materials	4.94	4.48	6.17	6.37	7.47	5.89

* The cost per acre for each item is the average for the acres involved; hence, the total average cost is not the sum of the individual items.

† Dashes indicate data not available.

The use of commercial fertilizer was not a general practice. Superphosphate, ammonium sulphate, and liquid ammonia were the kinds reported. The data were insufficient to indicate statistically whether or not it paid to use fertilizer. The growing of a green-manure crop was a common practice, particularly on land where flax followed flax. Sesbania (*Sesbania macrocarpa*), also known as "wild hemp," is the most satisfactory summer covercrop in Imperial Valley. Usually yields are from 10 green tons to an extreme of 24 tons per acre, with an average of approximately 15 tons. Sesbania generally develops to sufficient maturity for turning under in from 55 to 60 days from the time of seeding.

Harvesting Flax Straw.—After the seed is harvested, the flax straw is raked, baled, and hauled to the fiber mill. Before the establishment of the fiber mill in El Centro in 1937, there was no market for the straw. It was usually disposed of by burning and plowing under. The straw, in order to be acceptable to the mill, must be free from weeds. The average yield of straw for the records in the enterprise-efficiency study was about 0.7 ton per acre. The Southwest Flaxseed Association reports that some fields yield more than 2 tons of straw per acre.

Table 13 presents costs and income from straw per acre and per ton for the records in the study. The contract price for straw baled and delivered to the fiber mill for 1938 and 1939 was $7.20 per ton. The average cost of harvesting and hauling for the records in the study was $4.62 in 1937, $5.26 in 1938, and $4.98 in 1939 (table 13). The net income per ton ranged from $1.94 to $2.22.

TABLE 13

AVERAGE YIELD, INCOME, AND HARVESTING COSTS OF FLAX STRAW PER ACRE AND PER TON, 1937–1939

	1937	1938	1939
Number of records in the study	17	17	15
Number of records reporting harvesting straw	6	11	13
Total number of acres	1,061	1,223	1,730
Total number of tons harvested	488.0	1,025.2	1,329.5
Average yield per acre, tons	0.46	0.84	0.70
Dollars per acre			
Total income	3.08	6.04	5.09
Total harvesting costs	2.12	4.41	3.83
Net income	0.96	1.63	1.26
Dollars per ton			
Total income	6.70	7.20	7.20
Total harvesting costs	4.62	5.26	4.98
Net income	2.08	1.94	2.22

The usual contract prices for performing the operations necessary to harvest the straw for 1939, as reported by the Southwest Flaxseed Association, were as follows: mowing, $0.50 per acre; raking, $0.50 per acre; baling, $2.75 per ton; and hauling 0 to 5 miles, $1.25 per ton, 5 to 10 miles $1.35 per ton, and over 10 miles, $1.45 per ton.

TABLE 14

RENTAL COSTS PER ACRE, 1935–1939

Year	Number of cash renters	Amount paid per acre	Number of share renters		Value of share of crop paid
			¼ share of crop	⅓ share of crop	
		dollars			*dollars*
1935	1	9.50	6	0	7.75
1936	1	10.00	8	0	7.89
1937	0	0.00	3	2	17.32
1938	2	18.75	3	4	19.94
1939	3	15.00	1	0	16.41
5-year average or total	7	13.31	21	6	13.86

Rental Costs.—Table 14 presents data on rental costs per acre. Seven coöperators in the study paid an average of $13.31 per acre cash rent. Twenty-seven coöperators paid a share of the crop valued at $13.86 per acre.

The rental basis in 21 records was one-fourth share of the crop and in 6 records was one-third share. The landowner paid the irrigation-district tax and, in a few cases, furnished a portion of the sacks, some equipment, or other small items.

STANDARD COSTS

Table 15 presents a standard of inputs and costs for flax production in Imperial Valley with an assumed yield of 1,232 pounds, or 22 bushels of recleaned flaxseed plus 120 pounds of dockage. No allowance is made for straw, although uses are being developed which may return a small income above the cost of its removal. Since flax is the only California crop reckoned in bushels, costs are shown on that basis as well as on the hundredweight basis.

Labor costs shown in table 15 are based on the following hourly rates: man labor, $0.30; 26 drawbar-horsepower tractor, $1.50; 1½-ton truck, $1.50; combine engine, $0.75. The combine is assumed to serve 300 acres, the rest of equipment, 200 acres.

This schedule provides for the cultural care considered necessary for the production of a good yield. Weed competition, being one of the worst problems, is met by two irrigations and cultivations before planting. With adjustments, particularly in water costs, the standard can be made to fit other parts of the state.

The purpose of table 15 is not to present an average cost but to present costs as they would occur under the specified conditions with a fairly high standard of efficiency in management. It may be used as a goal or standard to which results on individual farms may be compared or as a guide for computing probable costs under other conditions or production levels.

PROCESSING AND TRADE

PRODUCTS OF FLAX

Flaxseed comes from the combine harvester in sacks of approximately 100 pounds. In this form it is called "field-run" flaxseed. It is hauled to the warehouse or oil presses where it is recleaned. The mature oil-bearing seed is separated from all other materials. The material thus removed is called "dockage" and consists of immature and cracked flaxseed, hulls, and chaff from the flax plant, weed seed, volunteer grains, and other foreign material. This by-product is utilized as a stock feed and is sold direct to feeders or to feed mills that blend it with other feeds. Its feed value varies widely, according to the percentage of cracked seed and volunteer grains. The market price varies from $8.00 to $20.00 per ton. The percentage of dockage varies from 3 to 18 per cent.

The recleaned seed moves to the oil presses where it is separated into two products—raw linseed oil and linseed meal. Linseed oil is the more important of the two products. The percentage of oil for the United

TABLE 15

A STANDARD OF INPUTS AND COSTS FOR FLAX PRODUCTION IN THE IMPERIAL VALLEY

	Man labor per acre	26 hp. tractor work per acre	1½-ton truck work per acre	Cost per acre[*]	Cost per hundredweight	Cost per bushel[†]
Labor costs						
	hours	*hours*	*hours*	*dollars*	*dollars*	*dollars*
Plowing	1.2	1.2	...	2.16	....	....
Other preplanting tillage	1.2	1.2	...	2.16	....	....
Border and ditch work	0.5	0.5	...	0.90	....	....
Planting and mulching	0.5	0.4	0.1	0.90	....	....
Irrigation, 7 times	6.0	...	...	1.80	....	....
Total cultural labor	9.4	3.3	0.1	7.92	0.64	0.36
Windrowing	1.0	0.5	...	1.05	0.09	0.05
Combining with pickup	4.0	1.0	(1.0 comb.)[‡]	3.45	0.28	0.16
Hauling	1.0	...	0.4	0.90	0.07	0.04
Recleaning	contract	...	...	1.35	0.11	0.06
Total labor	15.4	4.8	0.5	14.67	1.19	0.67
Material costs						
				dollars	*dollars*	*dollars*
Irrigation tax, $2.25, gate $0.10, water 2.5 acre-feet at $1.25				3.60	0.29	0.17
Seed, 40 pounds at $4.00 per hundredweight				1.60	0.13	0.07
Sacks and twine, 13 used sacks				1.07	0.09	0.05
Total material cost				6.27	0.51	0.29
Cash-overhead costs						
				dollars	*dollars*	*dollars*
General expense, estimated at 5 per cent of above costs				1.04	0.08	0.05
County taxes				1.50	0.12	0.07
Machinery repairs				0.50	0.04	0.02
Compensation insurance				0.18	0.02	0.01
Total cash-overhead cost				3.22	0.26	0.15
Total cash costs (labor, material, and cash overhead)				*24.16*	*1.96*	*1.11*

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[*] Labor costs per acre are computed at the following rates per hour: man labor, $0.30; 26 drawbar-horsepower tractor, $1.50; 1½-ton truck, $1.50; combine engine, $0.75.

[†] All costs per bushel are based on a yield of 22 bushels, or 1,232 pounds of recleand flaxseed per acre plus 120 pounds of dockage.

[‡] 1.0 hour of combine work per acre rather than truck work.

(*Concluded on next page.*)

TABLE 15—(*Concluded*)

A STANDARD OF INPUTS AND COSTS FOR FLAX PRODUCTION IN THE IMPERIAL VALLEY

	Cost per acre*	Cost per hundredweight	Cost per bushel†
Depreciation costs			
	dollars	*dollars*	*dollars*
Depreciation on buildings and improvement	0.05	....	....
Depreciation on irrigation equipment	0.10	....	....
Depreciation on tillage equipment	0.50	....	....
Depreciation on seeding equipment	0.03	....	....
Depreciation on swather and combine	0.60	....	....
Depreciation on small tools and miscellaneous	0.10	....	....
Total depreciation costs	1.38	0.11	0.06
Total cash and depreciation costs	*25.54*	*2.07*	*1.17*
Interest costs, computed at 5 per cent of average value			
	dollars	*dollars*	*dollars*
Interest on value of buildings and improvements, $0.50	0.03	....	....
Interest on value of irrigation equipment, $0.50	0.02	....	....
Interest on value of tillage equipment, $2.50	0.12	....	....
Interest on value of seeding equipment, $0.25	0.01	....	....
Interest on value of swather and combine, $3.00§	0.15	....	....
Interest on value of small tools and miscellaneous, $0.50	0.03	....	....
Interest on value of land, $100.00	5.00	....	....
Total interest on investment	5.36	0.44	0.24
Total all costs	*30.90*	*2.51*	*1.41*
Less value of dockage, 10 per cent, 120 pounds at $0.50 per hundredweight	0.60	0.05	0.03
Net cost of flaxseed, recleaned	30.30	2.46	1.38

* Labor costs per acre are computed at the following rates per hour: man labor, $0.30; 26 drawbar-horsepower tractor, $1.50; 1½-ton truck, $1.50; combine engine, $0.75.

† All costs per bushel are based on a yield of 22 bushels, or 1,232 pounds of recleaned flaxseed per acre plus 120 pounds of dockage.

§ Combine assumed to serve 300 acres; rest of equipment, 200.

States crop as a whole averages approximately 33 per cent (see table 25). The market value of the oil represents about 70 per cent of the total value of the seed.

Flaxseed Analysis.—Several samples of the 1938 flaxseed crop from Imperial Valley were subjected to chemical analysis. The results in table 16, as compared with data in table 25, show that the percentage of oil content averages from 5 to 8 per cent higher than the average for the United States.

A useful indication of the drying quality of an oil is its iodine number, which represents the percentage by weight of iodine that a fat or oil will absorb under specified conditions. The capacity of an oil to absorb iodine is associated with its capacity for absorbing oxygen quickly, which determines to a large extent the utility of the oil for drying purposes. In general, a fat or oil having an iodine number of less than 100 is classed as nondrying, one having an iodine number of between 100 and 130 as semidrying, and one having a number above 130 as drying.[6] There are other properties of drying oils, however, that make them useful for special purposes.

TABLE 16

ANALYSES* OF IMPERIAL VALLEY FLAXSEED, 1938 CROP

Variety and sample number	Weight per 1,000 seeds	Oil (8 per cent moisture basis)	Iodine no. of oil	Crude protein (12 per cent moisture 4.5 per cent oil)
	grams	*per cent*		*per cent*
Punjab				
393	6.32	41.28	190.4	30.93
394	6.34	40.72	189.6	30.57
395	6.23	41.23	192.0	30.80
396	6.20	41.19	189.2	30.51
397	6.27	41.65	191.2	30.31
398	6.37	40.97	189.8	31.70
399	6.62	40.64	190.2	31.62
400	5.94	38.64	179.8	33.81
401	6.16	40.46	191.4	30.74
402	6.41	40.75	190.4	31.04
403	6.51	41.83	192.7	28.85
404	6.68	39.28	187.4	34.92
405	6.17	39.37	184.5	33.65
406	6.04	39.65	187.7	34.87

* Analyses made by T. H. Hopper, Agricultural Chemist, North Dakota Agricultural Experiment Station, Fargo, North Dakota.

Source of data:
Records of the Southwest Flaxseed Association, Imperial, California.

The iodine number of an oil varies considerably with different samples and different methods of testing. In table 17 the range of iodine numbers for the principal drying oils is shown in order of maximum tests. Linseed oil ranks third highest. The samples from Imperial Valley seed, as shown in table 16, compare very favorably with the iodine number for linseed oil and other oils reported in table 17.

Linseed meal represents from 60 to 68 per cent of the seed by weight and approximately 30 per cent of the value. It is used primarily as a feed for livestock and its chief value is due to its high percentage of protein (see table 16).

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[6] Dewees, Anne. Fats, oils and oleaginous raw materials—production, prices, trade, disappearance in the United States, 1912–35, and available data for earlier years. U. S. Dept. Agr. Statis. Bul. 59:122. 1937.

Flax Straw.—Flax straw is baled and sold by the grower to the fiber mill (see p. 15 and table 13). The processing at the mill results in two products—tow fiber and shive. Fiber represents about 20 per cent of the straw and is used in the manufacture of cigarette paper. Shive is the woody portions of the straw and other foreign matter. It is being used experimentally as a feed roughage, bedding, organic fertilizer, mulching, and packing material.

TABLE 17

IODINE NUMBER OF PRINCIPAL DRYING OILS

Oil	Iodine no.	Oil	Iodine no.
Oiticica	218[*]	Whale	110–150
Perilla	185–206	Soybean	124–148
Linseed	179–204	Safflower	146
Sardine	160–190	Rubberseed	133–143
Menhaden	140–180	Herring	123–142
Tung	160–170[†]	Poppy-seed	132–140
Hempseed	150–166	Sunflower	120–136
Walnut (English)	140–152	Corn	116–130

[*] Varies widely according to sample and method of determination.

[†] "Does not fully show the relative high drying power of tung oil. It has been known to show an iodine no. between 220 and 235 with methods causing the more complete absorption of iodine." (Concannon, C. C. Tung oil. U. S. Dept. Com. Bur. Foreign and Dom. Com. Trade Promotion Ser. no. **133**:50. 1932.)

Source of data:

Adapted from: Dewees, Anne. Fats, oils and oleaginous raw materials—production, prices, trade, disappearance in the United States, 1912–35, and available data for earlier years. U. S. Dept. Agr. Statis. Bul. **59**:122. 1937.

MARKET OUTLETS

The Southwest Flaxseed Association was organized in 1934 in Imperial County, for the purpose of assisting flax growers to market their product. Any farmer engaged in growing flax may obtain membership and market his product through the Association by signing a membership marketing agreement and adhering to the other provisions of the Association.[7] In 1938 and 1939 the Southwest Flaxseed Association handled in excess of 80 per cent of the flax production in Imperial Valley.

Flaxseed produced in California is also marketed through local buyer representatives of commercial oil-pressing companies. These buyers usually purchase from the farmer in the field, paying him on the basis of recleaned seed. If the farmer chooses to clean his own seed and then sell it, this can be done. The buyers reckon that the amount of dockage usually pays for the cleaning.

A number of commercial processing companies are interested in production of flaxseed in California. Several of them have done much to encourage the development of the industry. At the present time there are adequate facilities for crushing and sufficient mills interested to provide ample market outlets for all flaxseed grown in the state thus far. Several of the commercial processing companies enter into contracts with growers in order that they may be assured of sufficient supply for crushing.

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[7] Further information may be obtained by writing to the Southwest Flaxseed Association, Imperial, California.

FACTORS AFFECTING THE PRICE OF FLAXSEED

Changes in the price of flaxseed result directly from changes in prices of linseed oil and linseed meal produced from flaxseed. The price of flaxseed is also influenced indirectly from changes in the factors affecting the prices of oil and meal. Changes in linseed-oil prices have the greater influence on flaxseed prices, however, since the value of linseed oil in the United States represents about 70 per cent of the total value of flaxseed products.

Because the United States is a net importer (see fig. 1) of flaxseed and linseed oil and a net exporter of linseed cake and meal (see table 28), domestic prices of those commodities are affected not only by domestic conditions of supply and demand but also by foreign conditions. Prices of flaxseed, linseed oil, and linseed meal in the United States tend to change in the same direction as prices in other world markets.

World prices of linseed oil are influenced chiefly by two factors: (1) world supplies of flaxseed available for crushing, and (2) building activity. These two factors, however, do not entirely explain changes in prices of linseed oil, since several oils, such as tung oil and perilla oil, compete with linseed oil for drying purposes. However, the quantity of linseed oil used for drying purposes in the United States far exceeds that for any of the other drying oils. This has been largely because of the early development of its use as a drying oil, its general suitability for drying purposes, and its availability in large quantities. In 1937, approximately 68 per cent of the total fats and oils used for drying purposes in the United States was linseed oil, while 18 per cent of the total was tung oil, 5 per cent perilla oil, 5 per cent fish oils, 2 per cent soybean oil, and 2 per cent other oils (see table 26).

The factors affecting prices of linseed cake and meal are distinctly different from those affecting prices of linseed oil. Linseed cake and meal are used primarily as high-protein feed for livestock. They compete directly with such products as cottonseed cake and meal, soybean cake and meal, and peanut cake and meal, the first two of which are produced in fairly large quantities in this country. Other feeds competing with linseed cake and meal are the feed grains and certain by-product feeds (see table 27). Fluctuations in prices of linseed and other high-protein meals tend to follow the same general course, with changes in prices of the different high-protein meals in relation to each other occurring largely as a result of relative changes in supplies and in shipping costs arising both from variations in freight rates and in average distances of shipment to places where such feeds are consumed.

Each of the above-mentioned factors has some influence either directly or indirectly on the prices farmers are likely to receive for flaxseed.

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APPENDIX OF WORLD FLAX STATISTICS

TABLE 18

World Flaxseed Production by Principal Countries, Average 1925–1934 and Annual 1937

Country	Average 1925–1934		1937	
	Production	Per cent of total	Production	Per cent of total
	1,000 bushels	*per cent*	*1,000 bushels*	*per cent*
Argentina	73,868	50.18	60,603	46.62
Russia	26,156	17.77	29,500	22.69
India	17,016	11.56	17,800	13.69
United States	15,858	10.77	7,089	5.45
Canada	3,392	2.31	775	0.60
Uruguay	2,885	1.96	3,728	2.87
Poland	2,297	1.56	2,964	2.28
Other countries	5,728	3.89	7,541	5.80
World total	147,200	100.00	130,000	100.00

Source of data: United States Department of Agriculture. Agricultural Statistics **1939**:81. 1939.

TABLE 19

Imports of Flaxseed into the United States by Country of Origin, 1920–1937

Calendar year	Argentina	Canada	British India	China	Others	Total
	1,000 bushels	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
1920	22,778	1,638	—*	63	162	24,641
1921	8,885	3,095	—	134	212	12,326
1922	12,213	2,254	12	214	220	14,913
1923	21,151	3,008	40	68	65	24,332
1924	13,838	2,750	—	1	—	16,589
1925	10,537	5,917	—	7	49	16,510
1926	19,443	3,043	—	1	63	22,550
1927	19,365	2,411	—	9	36	21,821
1928	14,941	2,599	—	—	39	17,579
1929	23,120	1,063	59	—	1	24,243
1930	11,526	915	—	—	221	12,662
1931	13,264	1,214	2	—	—	14,480
1932	7,400	519	—	—	—	7,919
1933	11,288	383	2,037	10	107	13,825
1934	8,592	330	4,221	418	609	14,170
1935	16,151	72	934	300	103	17,560
1936	13,167	530	1,294	369	5	15,365
1937	27,385	2	362	163	120	28,032
1938	14,342	31	95	3	893	15,364

* Dashes indicate data not available.

Source of data:

United States Department of Commerce Bureau of Foreign and Domestic Commerce. Foreign commerce and navigation of the United States. Annual Issues.

TABLE 20

STOCKS, PRODUCTION, NET IMPORTS, AND UTILIZATION OF FLAXSEED IN UNITED STATES, 1921–22 TO 1938–39

Year*	Stocks of old seed beginning season	Production	Net imports	Total supplies	Utilization†
	1,000 bushels	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
1921–22	5,680	8,107	13,630	27,417	26,030
1922–23	1,387	10,520	25,006	36,913	33,415
1923–24	3,498	16,563	19,577	39,638	37,782
1924–25	1,856	31,220	13,419	46,495	42,522
1925–26	3,973	22,334	19,354	45,661	40,948
1926–27	4,713	18,531	24,224	47,468	41,818
1927–28	5,650	25,174	18,112	48,936	44,766
1928–29	4,170	19,118	23,494	46,782	41,763
1929–30	5,019	15,924	19,652	40,595	37,373
1930–31	3,222	21,673	7,813	32,708	30,225
1931–32	2,483	11,755	13,849	28,087	25,187
1932–33	2,900	11,511	6,213	20,624	18,524
1933–34	2,100	6,904	17,901	26,905	24,392
1934–35	2,513	5,661	15,332	23,506	21,325
1935–36	2,181	14,520	15,388	32,089	28,758
1936–37	3,331	5,273	26,096	34,700	31,361
1937–38	3,339	7,089	17,860	28,288	26,089
1938–39	2,199	8,152	18,744	29,095	26,799
1939–40‡	2,296	20,330			

* Year beginning July 1.

† Total supplies less stocks at beginning of following season. ‡ Preliminary.

Source of data:

United States Department of Agriculture Bureau of Agricultural Economics. Quarterly Flax Market Reviews. (Mimeo.)

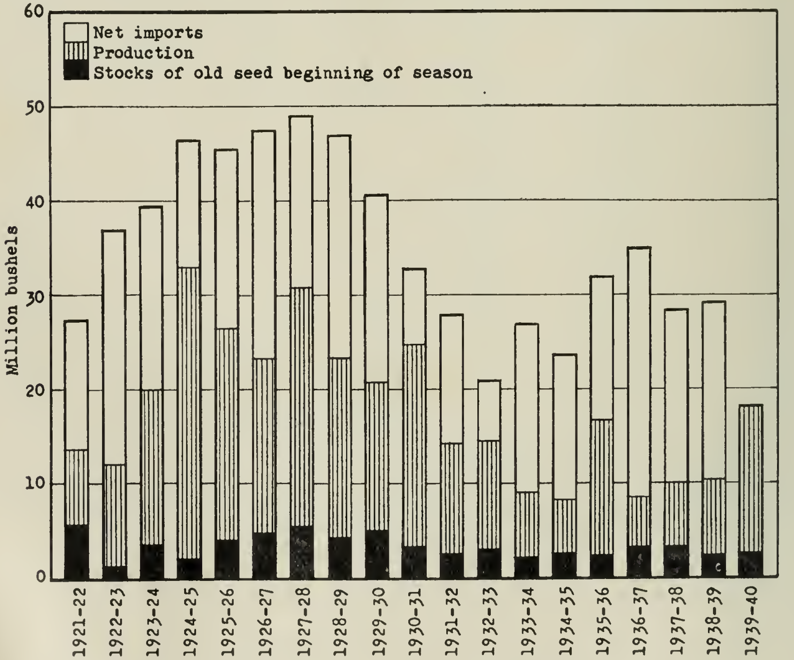


Fig. 1.—Stocks, production, and net imports of flaxseed, United States, 1921–22 to 1939–40 (year beginning July).

Data from table 20.

TABLE 21

ACREAGE, YIELD, AND PRODUCTION OF FLAXSEED IN UNITED STATES AND ARGENTINA, 1920–1938

Year	United States				Argentina			
	Acres sown	Acres harvested	Yield per harvested acre	Production	Acres sown	Acres harvested	Yield per harvested acre	Production
	1,000 acres	*1,000 acres*	*bushels*	*1,000 bushels*	*1,000 acres*	*1,000 acres*	*bushels*	*1,000 bushels*
1920	1,745	1,647	6.6	10,900	4,769	4,676	12.8	60,006
1921	1,180	1,143	7.1	8,107	3,892	3,603	10.0	36,046
1922	1,125	1,113	9.5	10,520	4,317	4,275	11.1	47,577
1923	2,045	2.015	8.2	16,563	5,391	5,361	10.8	58,005
1924	3,570	3,535	8.8	31,220	6,322	5,379	8.4	45,084
1925	3,100	3,022	7.4	22,334	6,201	6,062	12.4	75,113
1926	2,923	2,736	6.8	18,531	7,288	7,127	11.3	80,783
1927	2,819	2,763	9.1	25,174	7,055	6,891	12.0	82,672
1928	2,702	2,611	7.3	19,118	6,943	6,568	11.9	78,377
1929	3,363	3,049	5.2	15,924	7,092	5,231	9.6	50,004
1930	4,466	3,780	5.7	21,673	7,511	6,628	11.8	78,342
1931	3,724	2,431	4.8	11,755	8,640	8,178	10.9	89,067
1932	2,691	1,988	5.8	11,511	7,401	6,394	9.7	62,006
1933	1,812	1,341	5.1	6,904	6,855	4,877	12.8	62,595
1934	1,588	995	5.7	5,661	8,102	7,104	11.2	79,720
1935	2,392	2,096	6.9	14,520	6,573	5,607	10.6	59,445
1936	2,548	1,126	4.7	5,273	7,438	6,622	11.5	76,200
1937	1,346	934	7.6	7,089	7,023	5,666	10.7	60,604
1938	1,096	954	8.6	8,171	6,608	—*	—	63,766†

* Dashes indicate data not available.

† Preliminary.

Source of data:

Flaxseed prices and the tariff. p. 59. 76th Congress, 1st Session, Senate Document No. 62.

TABLE 22

ACREAGE, YIELD, PRODUCTION, AND SEASON AVERAGE PRICE PER BUSHEL RECEIVED BY FARMERS FOR FLAXSEED IN UNITED STATES, AVERAGE 1927–1936 AND ANNUAL 1937 AND 1938

State	Acreage harvested			Yield per acre			Production			Price for crop	
	Average 1927–1936	1937	1938	Average 1927–1936	1937	1938	Average 1927–1936	1937	1938	1937	1938*
	1,000 acres	*1,000 acres*	*1,000 acres*	*bushels*	*bushels*	*bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*dollars*	*dollars*
Michigan	5†	8	10	9.3†	6.0	9.0	59†	48	90	1.83	1.56
Wisconsin	6	4	4	10.9	10.5	11.0	72	42	44	1.79	1.55
Minnesota	699	453	453	8.0	9.0	10.5	5,572	4,077	4,756	1.87	1.62
Iowa	19	8	10	8.6	11.5	12.0	162	92	120	1.83	1.51
Missouri	3	5	4	4.5	4.0	5.0	14	20	20	1.75	1.53
North Dakota	932	292	298	4.8	5.3	5.0	4,896	1,548	1,490	1.81	1.55
South Dakota	312	53	45	4.5	4.3	8.5	1,720	228	382	1.82	1.57
Nebraska	8	—‡	1	5.2	—	8.5	50	—	8	—	1.54
Kansas	42	57	51	5.8	5.8	7.2	240	331	367	1.78	1.54
Montana	174	14	42	4.7	3.1	5.0	796	43	210	1.69	1.48
California	—	40	36	—	16.5	19.0	—	660	684	2.07	1.81
United States	2,218	934	954	6.0	7.6	8.6	13,751	7,089	8,171	1.87	1.61

* Preliminary.

† Short-time average, hence the figure for United States is not the total for this column.

‡ Dashes indicate data not available.

Source of data: United States Department of Agriculture. Agricultural Statistics **1939**:81. 1939

TABLE 23

FLAXSEED PRODUCTION BY STATES, 1920–1939

Year	Wisconsin	Minnesota	North Dakota	South Dakota	Montana	Total, 5 states	Michigan	Iowa	Missouri	Nebraska	Kansas	Wyoming	California	Total United States
	1,000 bushels	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
1920	86	3,401	4,109	2,090	910	10,596	—*	104	—	36	159	5	—	10,900
1921	48	3,150	2,709	1,404	572	7,883	—	68	—	16	134	6	—	8,107
1922	52	3,255	4,950	1,458	588	10,303	—	76	—	24	110	7	—	10,520
1923	100	5,006	7,875	2,414	880	16,275	—	63	—	44	173	8	—	16,563
1924	88	8,117	15,974	4,713	1,845	30,737	—	79	13	18	370	3	—	31,220
1925	148	7,400	9,789	3,781	760	21,878	—	105	12	51	284	4	—	22,334
1926	126	7,652	7,424	2,200	652	18,054	—	165	12	56	239	5	—	18,531
1927	120	7,343	10,433	5,125	1,650	24,671	—	200	28	60	165	50	—	25,174
1928	108	5,808	8,029	3,101	1,556	18,602	—	190	18	68	150	90	—	19,118
1929	77	4,608	6,394	3,144	1,195	15,418	20	117	10	134	126	99	—	15,924
1930	77	7,420	8,256	3,299	1,780	20,832	28	230	12	154	273	144	—	21,673
1931	66	6,027	4,051	528	463	11,135	40	184	9	21	346	20	—	11,755
1932	66	6,339	2,992	776	749	10,922	63	171	10	18	312	15	—	11,511
1933	40	4,365	1,674	115	192	6,386	72	182	14	12	236	2	—	6,904
1934	59	3,850	908	35	92	4,944	90	96	9	—	280	—	242	5,661
1935	66	6,432	5,616	950	228	13,292	100	168	10	28	348	4	570	14,520
1936	40	3,523	608	132	52	4,355	60	80	20	2	168	—	588	5,273
1937	42	4,077	1,548	228	43	5,938	48	92	20	—	331	—	660	7,089
1938	44	4,756	1,370	382	160	6,712	72	146	15	8	377	—	684	8,152†
1939‡	121	12,230	2,055	1,296	562	16,264	68	945	26	6	735	—	1,728	20,330§

* Dashes indicate data not available.

† Includes 138,000 bushels produced in Idaho, Washington, and Oregon.

‡ Preliminary.

§ Includes 558,000 bushels produced in Texas, Arizona, Idaho, Washington, and Oregon.

Sources of data:

1920–1934, 1936–1937: Flaxseed prices and the tariff. p. 60. 76th Congress, 1st Session, Senate Document No. 62.

1935: United States Department of Agriculture. Agricultural Statistics **1937**:71. 1937.

1938–1939: United States Department of Agriculture Agricultural Marketing Service. General crop report as of December 1, 1939. (Mimeo.)

TABLE 24

FLAXSEED PRICES PER BUSHEL* AT MINNEAPOLIS, WINNIPEG, AND BUENOS AIRES, 1920–21 TO 1938–39

Year†	Minneapolis, No. 1 Northern	Winnipeg, No. 1 Canada Western	Buenos Aires	Differential between Minneapolis prices and those in:	
				Winnipeg	Buenos Aires
	dollars	*dollars*	*dollars*	*dollars*	*dollars*
1920–21	2.20	1.89	1.64	0.31	0.56
1921–22	2.27	2.00	1.69	0.27	0.58
1922–23	2.73	2.24	1.80	0.49	0.93
1923–24	2.46	2.08	1.71	0.38	0.75
1924–25	2.71	2.41	2.17	0.30	0.54
1925–26	2.53	2.14	1.77	0.39	0.76
1926–27	2.25	1 95	1.61	0.30	0.64
1927–28	2.21	1.90	1.65	0.31	0.56
1928–29	2.29	2.02	1.68	0.27	0.61
1929–30	3.11	2.48	2.02	0.63	1.09
1930–31	1.76	1.14	1.04	0.62	0.72
1931–32	1.36	0.84	0.64	0.52	0.72
1932–33	1.18	0.80	0.70	0.38	0.48
1933–34	1.87	1.47	1.07	0.40	0.80
1934–35	1.91	1.40	1.02	0.51	0.89
1935–36	1.73	1.47	1.15	0.26	0.58
1936–37	2.14	1.71	1.25	0.43	0.89
1937–38	2.07	1.64	1.29	0.43	0.78
1938–39	1.81	1.43	1.10	0.38	0.71

* One bushel of flax equals 56 pounds. † Year beginning August.

Sources of data:

1920–21 to 1924–25: United States Department of Agriculture. Agriculture Yearbook **1925**:841–42. 1926.

1925–26 to 1937–38: Flaxseed prices and the tariff. p. 71–74. 76th Congress, 1st Session, Senate Document No. 62.

1938–39: United State Department of Agriculture Bureau of Agricultural Economics. Quarterly Flax Market Review. August 15, 1939. (Mimeo.)

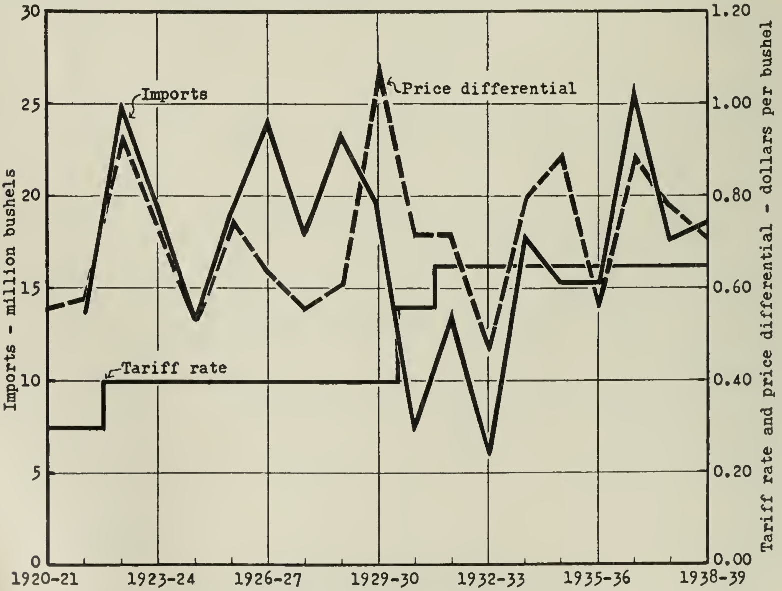


Fig. 2.—Differential price of flaxseed, Minneapolis above Buenos Aires, tariff rate, and net imports into the United States, 1920–21 to 1938–39.
Data from tables 20, 24, and 29.

TABLE 25

FLAXSEED CRUSHED, LINSEED OIL PRODUCED, PERCENTAGE OF OIL IN FLAXSEED CRUSHED, UNITED STATES, 1920–21 TO 1937–38, AND PRICE OF RAW LINSEED OIL AT NEW YORK AND LINSEED MEAL AT MINNEAPOLIS AND SAN FRANCISCO, 1920–21 TO 1938–39

Year	Flaxseed crushed*,†	Linseed oil produced*	Percentage oil produced of flaxseed crushed*	Price of raw linseed oil at New York‡	Price of linseed meal at Minneapolis§	Price of linseed meal at San Francisco§
	1	*2*	*3*	*4*	*5*	*6*
	1,000 bushels	*1,000 pounds*	*per cent*	*cents per pound*	*dollars per ton*	*dollars per ton*
1920–21	24,828	465,892	33.5	19.4	50.21	——¶
1921–22	23,276	435,289	33.4	9.3	47.31	——
1922–23	33,806	646,756	34.2	11.2	49.48	——
1923–24	35,529	659,192	33.1	13.1	43.57	53.12
1924–25	40,996	757,784	33.0	13.0	43.31	52.54
1925–26	39,716	731,606	32.9	13.9	45.24	53.70
1926–27	40,136	745,164	33.2	11.1	45.67	51.68
1927–28	43,243	810,603	33.5	10.4	48.35	52.24
1928–29	39,595	737,534	33.3	10.0	52.99	53.50
1929–30	35,504	651,038	32.7	12.2	52.72	52.94
1930–31	27,054	488,545	32.2	12.5	35.85	35.87
1931–32	23,699	438,763	33.1	8.4	27.22	28.78
1932–33	17,370	318,120	32.7	6.3	21.50	25.13
1933–34	23,006	442,797	34.4	9.0	32.24	28.34
1934–35	20,720	404,060	34.8	9.3	39.50	33.45
1935–36	26,544	505,531	34.0	9.4	26.13	28.52
1936–37	30,340	587,093	34.6	9.8	43.96	38.77
1937–38	25,870	504,810	34.8	10.8	38.15	37.58
1938–39	——	——	——	9.1	38.62‖	34.77

* Year beginning October, 1920–21 to 1926–27; year beginning July, 1927–28 to date.

† Bushels converted to pounds in calculating percentage of oil at the rate of 56 pounds per bushel of flaxseed.

‡ Calendar years, 1920–1938.

§ Year beginning July.

¶ Dashes indicate data not available.

‖ Average for six months.

Sources of data:

Cols. 1 and 2: 1920–21 to 1926–27: United States Department of Agriculture. Yearbook of Agriculture **1934**:449. 1934.

1927-28: United States Department of Agriculture. Agricultural Statistics **1938**:83. 1938.

1928–29 to 1937–38: United States Department of Agriculture. Agricultural Statistics **1939**:87. 1939.

Col. 3: Calculated.

Col. 4: Flaxseed prices and the tariff. p. 75. 76th Congress. 1st Session, Senate Document No. 62.

Col. 5: 1920–21 to 1926–27: United States Department of Agriculture. Yearbooks of Agriculture **1930**:667; **1933**:464; **1934**:450; **1935**:416; and Agricultural Statistics, **1937**:79.

1927–28 to 1938–39; Flaxseed prices and the tariff. p. 79. 76th Congress, 1st Session, Senate Document No. 62.

Col. 6: University of California College of Agriculture. 1939 Outlook tables. (Mimeo.)

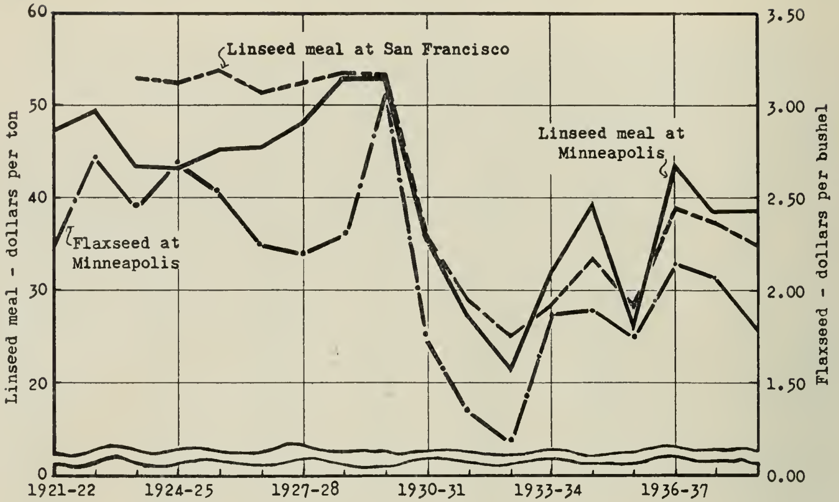
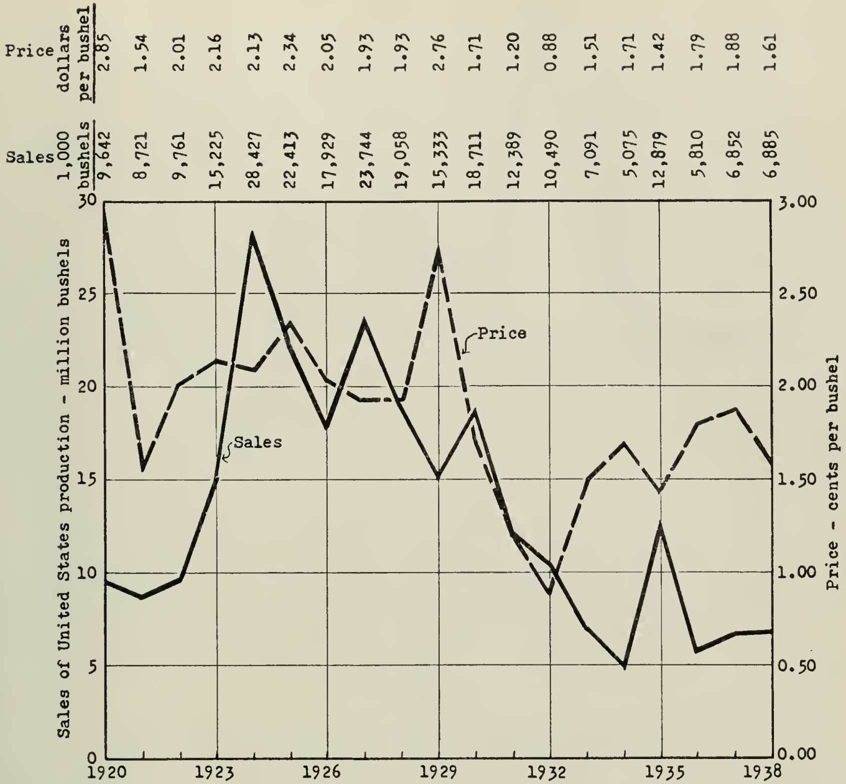


Fig. 3.—Price of linseed meal at San Francisco and Minneapolis and price of flaxseed at Minneapolis, 1921–22 to 1938–39.

Data from tables 24 and 25.



Price dollars per bushel	2.85	1.54	2.01	2.16	2.13	2.34	2.05	1.93	1.93	2.76	1.71	1.20	0.88	1.51	1.71	1.42	1.79	1.88	1.61
Sales 1,000 bushels	9,642	8,721	9,761	15,225	28,427	22,413	17,929	23,744	19,058	15,333	18,711	12,389	10,490	7,091	5,075	12,879	5,810	6,852	6,885

Fig. 4.—Sales and average price per bushel of flaxseed in the United States, 1920–1938. (Sales equal difference between production and amount used for seed. Price weighted by sales in each state.)

Data from: United States Department of Agriculture Bureau of Agricultural Economics. Income Parity for Agriculture. Part 1. Farm Income. Sec. 8. Income from Flaxseed. p. 9. July, 1939. (Processed.)

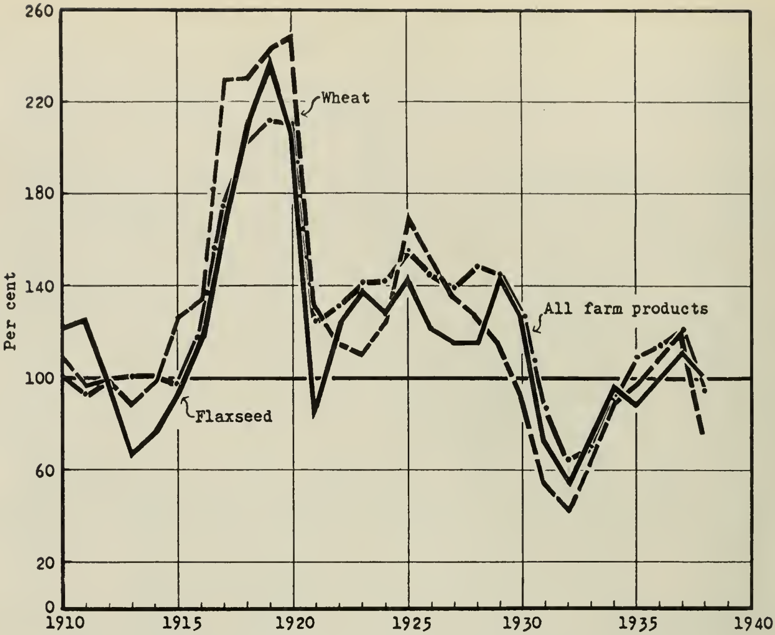


Fig. 5.—Prices received by farmers for flaxseed, wheat, and all farm products, 1910–1938. (Index numbers 1910–1914 = 100.)
Data from: Flaxseed Prices and the Tariff. p. 16. 76th Congress, 1st Session, Senate Document No. 62.

TABLE 26

Estimated Consumption of Oils in the Drying Industries, United States, 1912–1914 and 1925–1937

Calendar year	Linseed oil	Tung oil	Perilla oil	Fish oils	Soybean oil	Other oils*	Total	Linseed oil as percentage of total
	million pounds	*million pounds*	*million pounds*	*million pounds*	*million pounds*	*million pounds*	*million pounds*	*per cent*
1912	461	43	†	22	—‡	—‡	526	88
1913	603	42	§	11	—	—	656	93
1914	510	30	§	14	—	—	554	92
1925	726	87	6	30	—	—	849	86
1926	714	92	7	18	—	—	831	86
1927	756	85	5	20	—	—	866	87
1928	785	95	2	24	—	—	906	87
1929	789	110	6	21	—	—	926	85
1930	544	100	9	25	—	—	678	80
1931	471	90	11	27	9	4	612	77
1932	354	74	11	20	12	3	474	75
1933	376	102	25	22	14	5	544	69
1934	409	117	24	25	13	7	595	69
1935	465	129	60	32	18	9	713	65
1936	478	121	105	40	17	19	780	61
1937	571	151	39	44	17	12	834	68

* Other oils include hempseed oil, oiticica oil, sunflower oil, castor oil, and miscellaneous.
† Imports not reported prior to October, 1913.
‡ Dashes indicate data not available for years prior to 1931.
§ Less than 500,000 pounds.

Source of data:
Flaxseed prices and the tariff. p. 25. 76th Congress, 1st Session, Senate Document No. 62.

TABLE 27

SUPPLIES OF OILSEED CAKE AND MEAL, AND FEED GRAINS, UNITED STATES, 1925–1937

Year*	Cotton-seed cake and meal†	Linseed cake and meal†	Soybean cake and meal‡	Copra cake and meal‡	Peanut cake and meal‡	Total cake and meal	Linseed as percentage of total cake and meal	Feed grains§
	1,000 tons	*1,000 tons*	*1,000 tons*	*1,000 tons*	*1,000 tons*	*1,000 tons*	*per cent*	*1,000 tons*
1925	2,192	478	28	93	12	2,803	17.1	107,162
1926	2,429	462	32	91	10	3,024	15.3	98,938
1927	1,691	530	62	100	22	2,405	22.0	100,054
1928	2,048	476	91	115	17	2,747	17.3	102,855
1929	2,181	396	112	115	35	2,839	13.9	95,798
1930	2,011	370	122	102	17	2,622	14.1	84,966
1931	2,281	222	132	79	13	2,727	8.1	97,868
1932	1,962	220	113	100	17	2,412	9.1	113,768
1933	1,776	161	99	122	11	2,169	7.4	91,720
1934	1,633	222	287	116	49	2,307	9.6	59,510
1935	1,787	286	620	134	50	2,877	9.9	90,137
1936	2,158	303	548	142	69	3,220	9.4	62,720
1937	2,739	206	732	123	52	3,852	5.3	97,165

* Year beginning October 1.

† Production plus imports, less exports.

‡ Production plus imports.

§ Production of corn and grain sorghums, plus farm stocks of corn, oats, barley, and grain sorghums on October 1.

Source of data:

Flaxseed prices and the tariff. p. 26. 76th Congress, 1st Session, Senate Document No. 62.

TABLE 28

EXPORTS AND IMPORTS OF LINSEED OIL AND EXPORTS OF LINSEED CAKE AND MEAL, UNITED STATES, 1920–1937

Year*	Linseed oil		Linseed cake and meal exports†
	Exports	Imports	
	1,000 pounds	*1,000 pounds*	*1,000 pounds*
1920	4,210	14,974	391,264
1921	2,744	168,705	484,059
1922	3,105	56,764	574,612
1923	2,628	17,840	560,114
1924	2,405	23,587	691,126
1925	2,335	16,733	589,166
1926	2,738	1,331	625,121
1927	2,221	346	606,304
1928	2,020	6,677	645,120
1929	2,129	5,416	624,960
1930	1,298	256	304,640
1931	873	28	443,520
1932	781	36	241,920
1933	696	10,680	546,560
1934	795	3,086	380,800
1935	1,022	1,161	459,200
1936	1,096	452	562,240
1937	821	243	557,760

* Year beginning July 1.

† Imports of linseed cake and meal are rather small.

Source of data:

United States Department of Agriculture. Agricultural Statistics 1939:433, 467–68. 1939.

TABLE 29

UNITED STATES IMPORT-DUTY RATES ON FLAXSEED AND LINSEED OIL, 1897–1930

Year of Tariff Act	Flaxseed per bushel*	Linseed oil per pound
	cents	*cents*
1897	25	2.67
1909	25	2.00
1913	20	1.33
1921	30	1.33
1922	40	3.30
1929	56	3.70
1930†	65	4.50

* One bushel of flax equals 56 pounds.

† 1930 Tariff rates still in force.

Source of data:

United States Department of Agriculture Bureau of Agricultural Economics. Tariff rates on principal agricultural products. p. 19. May 10, 1939. (Mimeo.)

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